Offshore Scallop Fishing Experiment St. Pierre Bank, 1985

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ABSTRACT

Barney, W., G. Carberry, 1987. Offshore Scallop Fishing Experiment St. Pierre Bank, 1985. Cat. Tech. Rep. Fish. Aquat. Sci. 1548: vi + 43p.

In the fall of 1985 two vessels were chartered, equipped with offshore scallop gear, and directed to search for potentially commercial scallop beds on the St. Pierre Bank.

Their captains and crews were required to conduct fishing operations in the usual manner and to keep accurate records of all fishing locations, catch rates, meat counts and yield (meat weight as percentage of round weight), and to monitor and record onboard shucking rates. The information collected was to be used to assess the viability of such a fishing operation.

Barney, W., G. Carberry, 1987. Offshore Scallop Fishing Experiment St. Pierre Bank, 1985. Cat. Tech. Rep. Fish. Aquat. Sci. 1548: vi + 43p.

A l'automne de 1985, on a affrété deux bateau, on les a équipés d'engins de pêche hauturière des pétoncles et on leur a donné instruction de rechercher les bancs de pétoncles pouvant faire l'objet d'une exploitation commerciale sur le banc Saint-Pierre.

On a demandé aux capitaines et équipages de ces bateaux d'effectuer les opérations de pêche de façon normale et de tenir des statistiques précises sur tous les endroits de pêche, les taux de capture, les nombres de chairs et le rendement (poids des chairs en pourcentage du poids brut), et de surveiller et de consigner les taux d'écaillage à bord. Les informations recueillies devaient servir à évaluer la viabilité d'une telle opération de pêche.

PREFACE

To carry out an offshore scallop fishing experiment on St. Pierre Bank in 1985, two contracts were awarded. One was awarded to Cecil Rideout, owner of the **M/V SEA SONS II,** DFO/DSS Contract: OSC85-00441. The other contract was awarded to Robert Whalen, owner of the **M/V AVALON HARVESTER,** DFO/DSS Contract: OSC85-00432.

Scientific Authority for both contracts was:

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INTRODUCTION

During recent years some of the Newfoundland large (17 to 20 M) (55' to 65') inshore vessels have been having difficulties in their present fisheries. The Fisheries Development Branch, Department of Fisheries and Oceans, Newfoundland Region has alternative fisheries for these vessels. (This could also decrease pressure on currently heavily fished stocks).

Previous work conducted by the Region's Science Branch indicate that large beds of Iceland scallops (Chlamys islandica) exist on St. Pierre Bank (charts and posistions provided by K.S. Naidu). These beds were virtually untouched by the large offshore scallop draggers operating out of Nova Scotia because of the small size of the scallops and the high overhead of these vessels. The Development Branch carried out a fishing experiment to determining whether the large inshore vessels, with their lower overhead, could economically harvest this resource.

During the fall of 1985 two inshore vessels were chartered and equipped with offshore scallop gear. Their task was to locate and fish scallop beds on the St. Pierre Bank (for areas of survey see Fig. 1).

MATERIAL AND METHODS

VESSELS

The two vessels chartered were typical Newfoundland wooden fishing draggers. Both vessels have the wheel house built forward and were outfitted to fish for scallops by adding a shucking box and dumping table. The vessels have the following specifications:

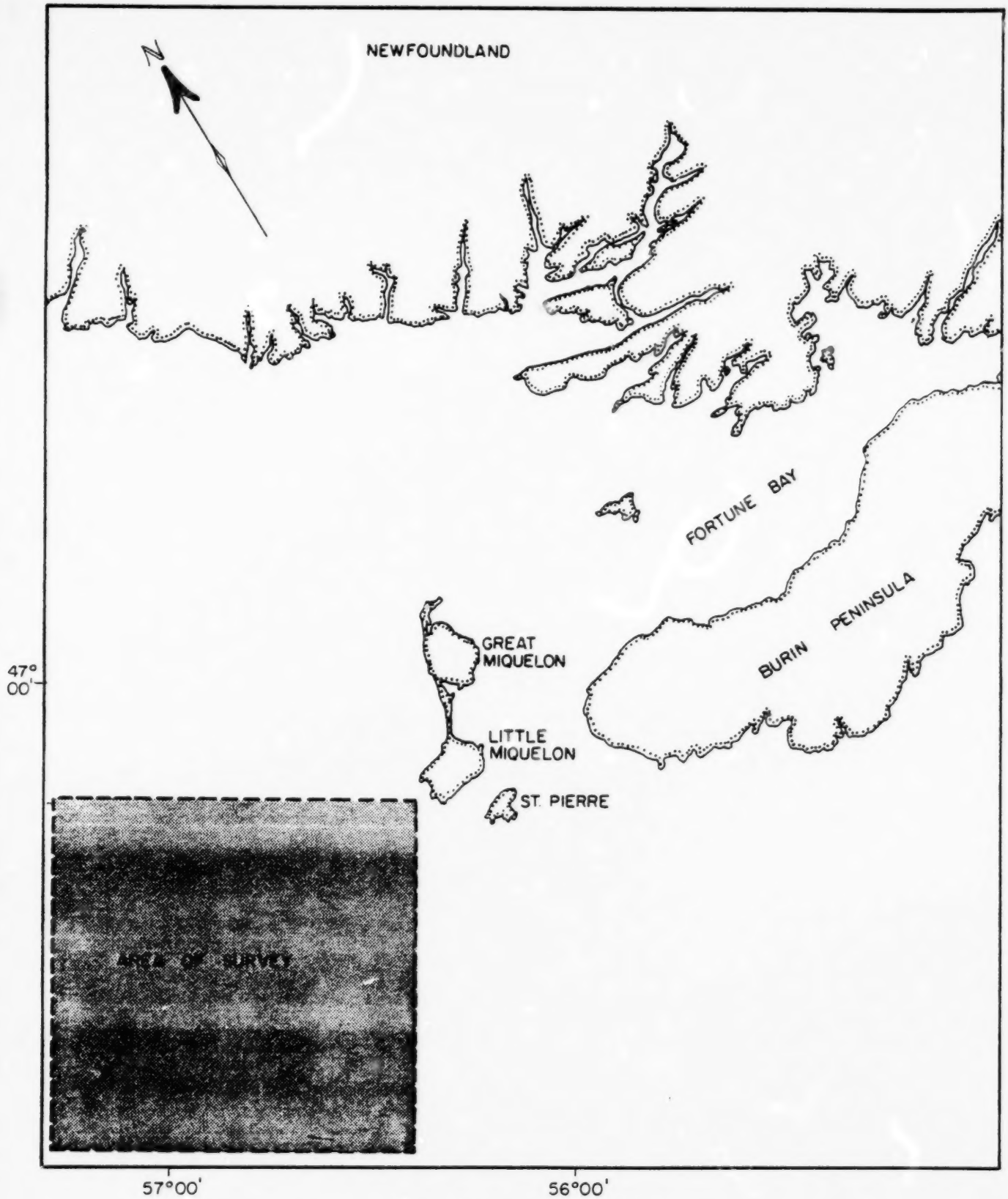


Fig. 1. OFFSHORE SCALLOP FISHING EXPERIMENT ST. PIERRE BANK 1985

M/V Sea Sons II - (Fig. 2) Built in 1984; overall length 18 M (60') and beam 7 M (23'); powered by a 625 horsepower Cummings diesel engine; navigation gear includes two JRC radars, one JRC colour plotter, one depth sounder, one Simrad colour sounder, one Simrad sonar, magnetic compass and autopilot; single side band and VHF radios.

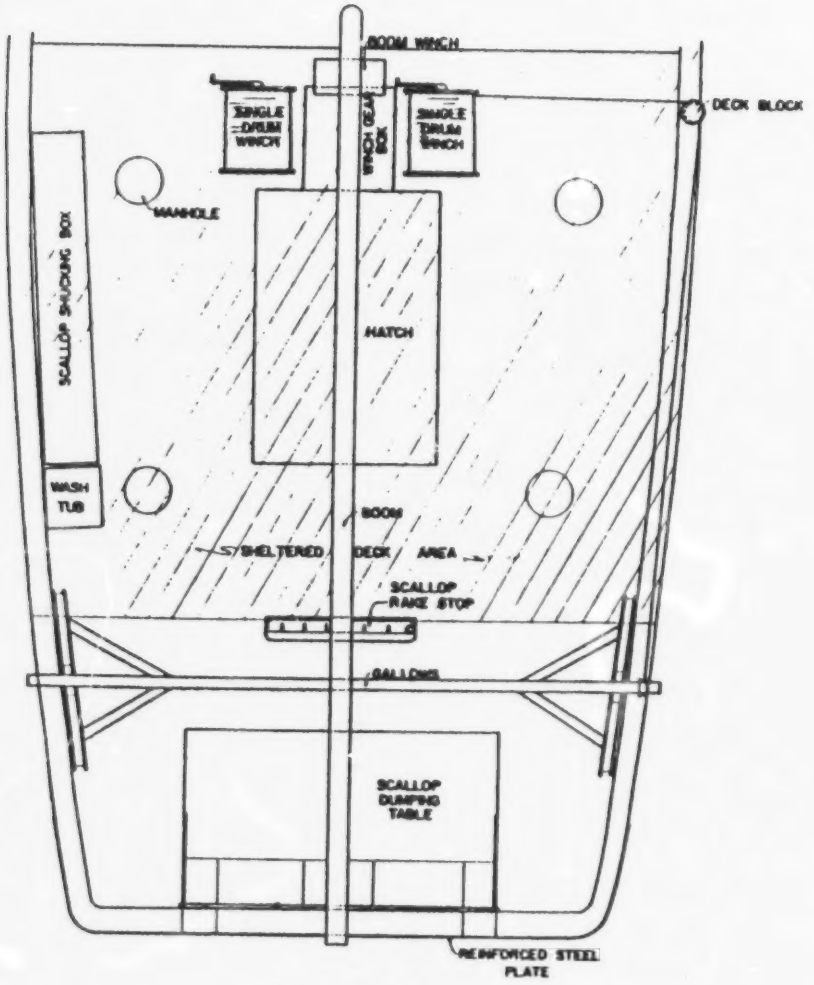
M/V Avalon Harvester - (Fig. 2) built in 1979; overall length 20 M (65') with a beam 7 M (23' 6"); powered by a 600 horsepower caterpillar diesel engine; navigation gear includes two Furno radars, one Furno plotter, one Furno depth sounder, one sonar; single side band and VHF radios. This vessel did not have a winch. One was installed.

The **M/V Sea Sons II**, was chartered for 30 days from September 9 to October 29, 1985. The **M/V Avalon Harvester**, was chartered for 25 days from September 13 to November 13, 1985. (Table 1)

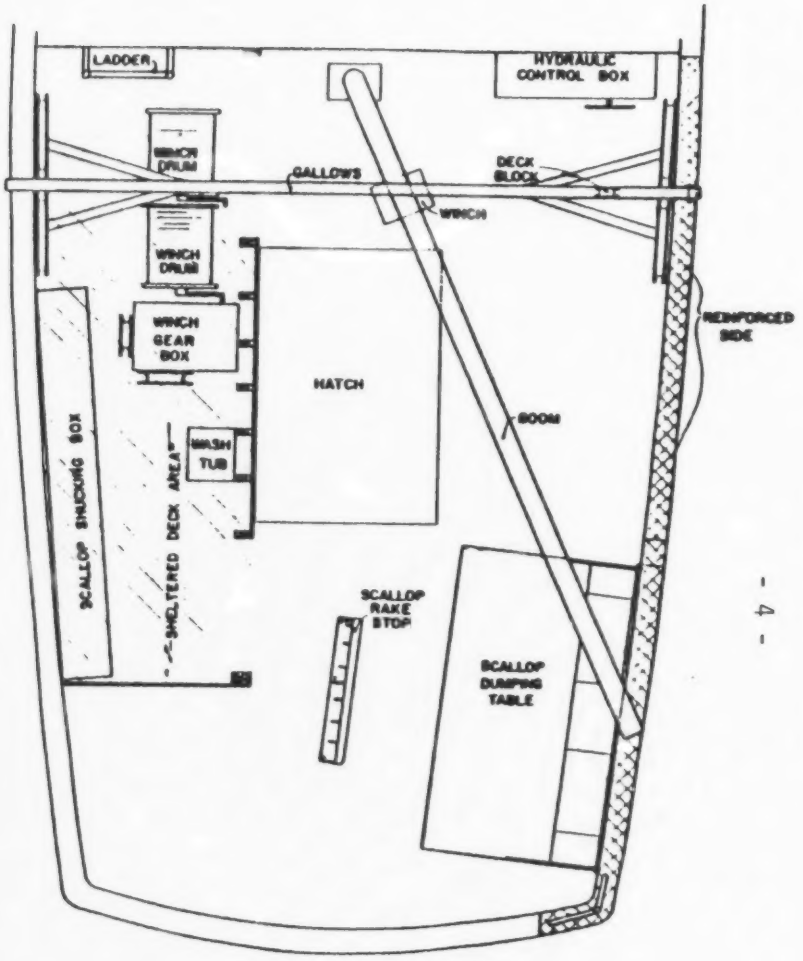
FISHING GEAR

Each vessel was equipped for fishing with one 10' offshore scallop rake (Fig. 3) of the "deep sea" type normally used by the offshore scallop fleet. (For more details on scallop gear construction see Appendix II.

The project was carried out between September 9 and November 13, 1985. During this time the vessels made trips of 1 to 4 days duration with a total of 295 sets completed. Fig. 3 shows the locations of all sets made and Fig. 4 indicating those successful sets. (Industry experience is that a set of two bushels or more constitutes a successful set).



M.V "SEA SONS II"



M.V "AVALON HARVESTER"

Fig. 2 DECK LAYOUTS OF CHARTERED VESSELS

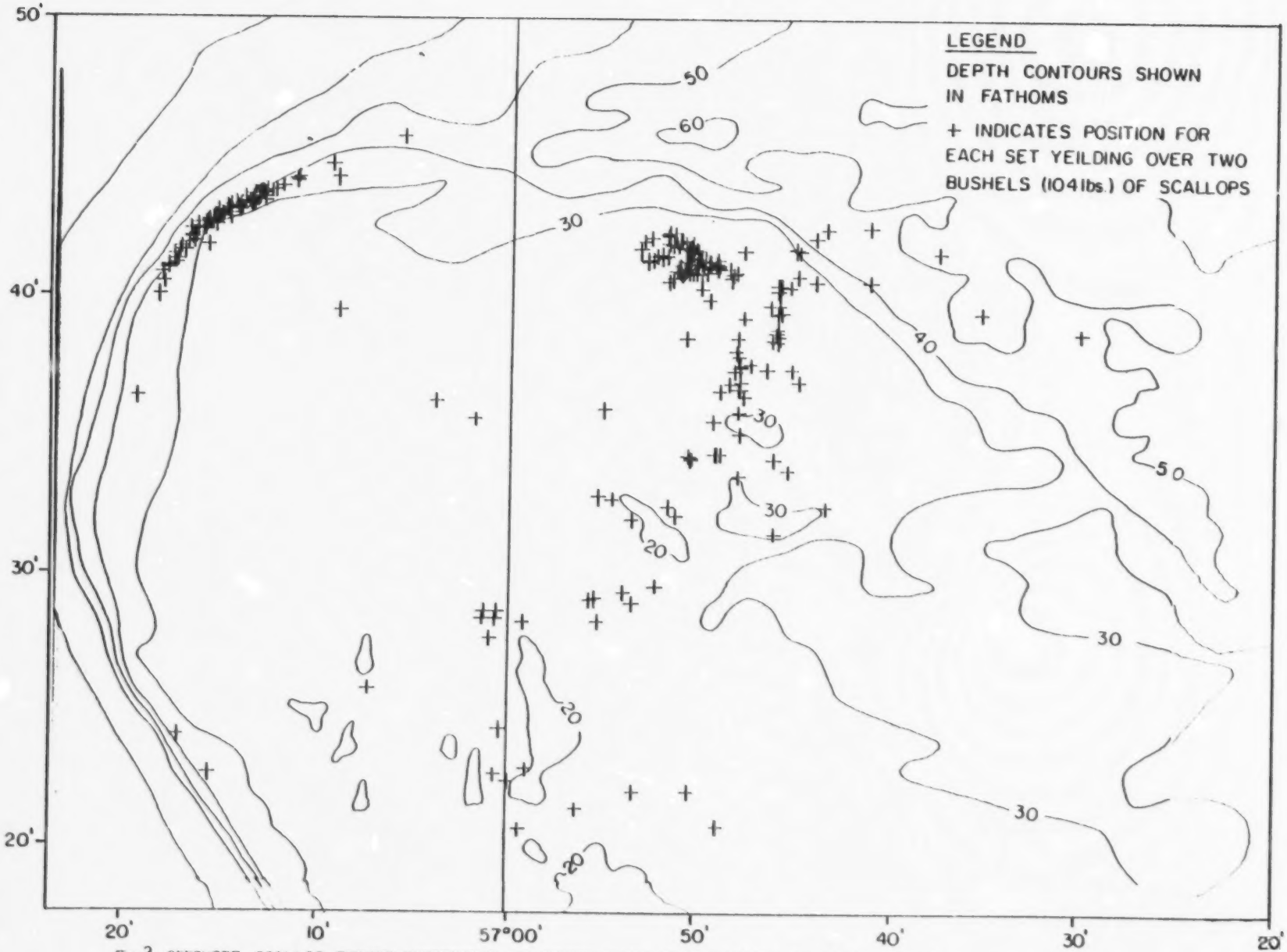


Fig. 3. OFFSHORE SCALLOP FISHING EXPERIMENT ST. PIERRE BANK 1985 SUMMARY OF AREAS FISHED

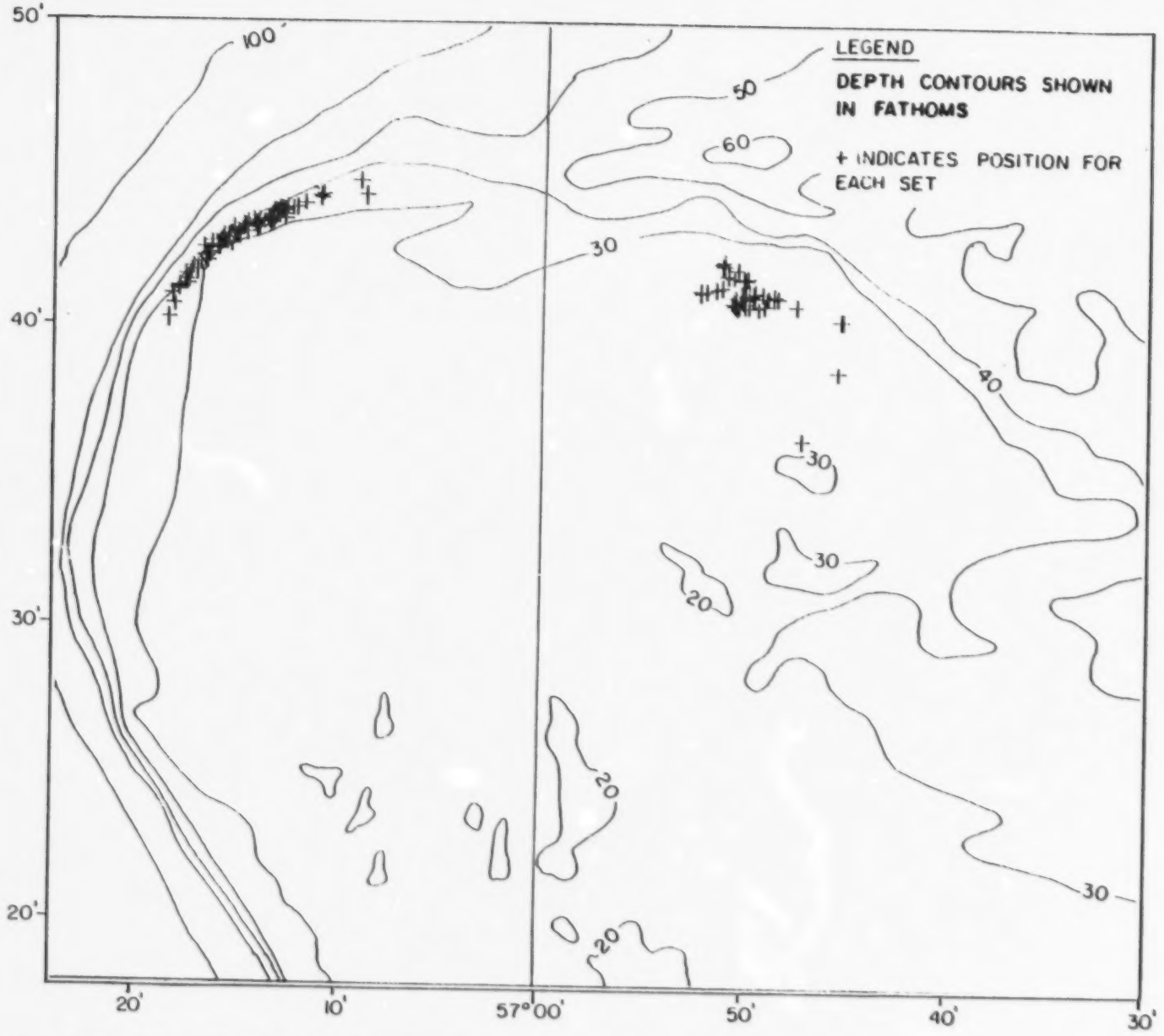


Fig. 4. OFFSHORE SCALLOP FISHING EXPERIMENT ST. PIERRE BANK 1985 Locations of Successful Sets.

SUMMARY OF RESULTS

A total of 174 tows were completed by **Sea Sons II** during 26 fishing days between September 9 and October 29. A total of 757 bushels (weighing approximately 23.5 kgs. (52 lbs.) of scallops per bushel) of scallop were caught during this time yielding an average of 4.35 bushels 103 kgs (226 lbs.) per tow. The **Avalon Harvester** completed 121 tows during 18 fishing days. A total of 461 bushels of scallops were caught for an average of 3.81 bushels, 90 kgs (198 lbs.) per tow.

Only one-half of the time at sea was actual fishing time because of bad weather conditions, and the necessity to land the catch. Fishing had to be curtailed because of high winds and/or heavy seas. During this charter frequent trips were made to ensure high quality of the catch.

SEARCHING FOR SCALLOPS

Searching was carried out in areas where the Fisheries Research Branch, Department of Fisheries and Oceans recorded good catches of Iceland scallop (Chlamys islandia during their scallop cruises.

Sea Sons II

The vessel spent seven full or partial days searching for scallop beds. During this time 54 tows were completed and 20 bushels, (approximately 472 kgs. (1040 lbs.) of round scallop were taken (this was 3% of the total catch for that vessel). The **Sea Sons II** was the first to start fishing and therefore completed a considerable amount of searching before the second vessel had started.

Six of the 20 bushels taken while searching were sea scallops (Placopecten magellanicus) taken in shallow water of less than 48 M (26 fms.) The remaining catch was Iceland scallops taken at depths greater than 49 M (27 fms.)

Avalon Harvester

This vessel spent five full or partial days searching for scallop beds. During this time 34 tows were completed for a yield of 16 bushels, (approximately 232 kgs. (512 lbs.) of round scallops (this was 3% of its total catch). Six of the 16 bushels taken were sea scallops caught in water depths less than 55 M (30 fms.). The remaining catch was Iceland scallops taken at depths greater than 51 M (28 fms.).

CATCHING SCALLOPS

The vessels discovered two large beds of Iceland Scallops (Fig. 5). The first bed found extended from 46°40'N to 46°45'N Latitude and from 57°10'W to 57°20'W Longitude on the northwestern side of St. Pierre Bank in 49 to 62 M (27 to 34 fms.). The second bed was located on the northeastern side of St. Pierre Bank from 46° 35' to 46° 43' N Latitude and from 56° 45' to 56° 53' W Longitude in 46 to 55 M (25 to 30 fms.) of water.

Bed One

This bed (Table 1) covered an area of approximately 10 square nautical miles. The shoreward edge of the bed is approximately 63 nautical miles from Fortune.

The **Sea Sons II** completed 60 tows on this bed which yielded 560 bushels (13,209 kgs. 29,120 lbs.) of raw scallops for an average of 9.3 bushels (230 kgs., 485 lbs.) per tow (Table 1). The average number of scallops per bushel

for this vessel was 400 with an average meat count of (87 per pound). The meat yield, by weight, was 8.4% of the round weight.

The **Avalon Harvester** completed 45 sets on Bed One, taking 311 bushels (7,335 kgs., 16,172 lbs.) of raw scallop or an average of 6.9 bushels (162 kgs., 358 lbs.) of scallops per tow (Table 1). The average number of scallops per bushel for the vessel was 380 and the average meat count was (83/lb. Here the yield of meat weight from raw scallop was 6.2%.

Combined catch rates on Bed One ranged from a quarter bushel (5.9 kgs., 13 lbs.) to 18 bushels (425 kgs., 936 lbs.) with an average of 8.3 bushels (196 kgs., 432 lbs.) per tow. The average number of scallops per bushel for both vessels was 393, while the average number of meats per pound was 86 and the average meat yield was 7.6 %.

The bottom of bed one consisted mostly of sand and small rock. Consequently the scallops contained a lot of sand which eventually got into the meat portions causing a lowering of the meat quality. The bed was old with many empty shells and a high density of scallops. The meats were watery, stringy and small, making them very difficult to shuck.

During her best 2 day fishing trip on this bed the **Sea Sons II** completed 18 sets[1] in 13 hours of fishing effort. The total catch for this period was 207 bushels (4,877 kgs., 10,751 lbs.) an average of 11.5 bushels (271 kgs., 597 lbs.) per tow or 15.9 bushels (375 kgs., 827 lbs.) per hour of fishing effort. The **Avalon Harvester** completed 30 sets[2] during the best 2 day trip and had a total catch of 241 bushels (5,685 kgs., 12,532 lbs.) in 23 hours of fishing effort. This averaged to 8.0 bushels (190 kgs., 418 lbs.) per tow or 10.5 bushels (247 kgs., 545 lbs.) per hour of fishing.

[1]For details see Appendix 1, Sets Nos. 110 to 127.
[2]For details see Appendix 1, Sets Nos. 175 to 204.

Table 1. Summary of Results.

Specifications	M/V Sea Sons 11			M/V Avalon Harvester		
Charter Period	Sept. 9 to Oct. 29			Sept. 13 to Nov. 13		
No. of Charter Days	30			25		
No. of Fishing Days	26			18		
	Bed 1	Bed 2	Searching	Bed 1	Bed 2	Searching
No. of Sets	60	60	54	45	42	34
Catch (Bushels)	560	177	20	311	134	16
Average Catch/Set (Bushels) Iceland Scallop	9.3	2.95	.37	6.9	3.2	.47
Average No. of Scallop/ Bushel	400	471		380	428	
Meat Count/lb.	87	72		83	71	
Meat Yield (%)	8.4	13.2		6.2	12.4	

Bed Two

This bed (Table 1) covered an area of approximately 25 square nautical miles. The shoreward edge of the bed is located approximately 47 nautical miles from Fortune.

The **Sea Sons II** completed 60 sets here taking 177 bushels (4,175 kgs., 9,204 lbs.) of raw scallops, an averaging of 2.95 bushels (70 kgs., 153 lbs.) per tow (Table 1). The average number of scallops per bushel for this vessel on Bed Two was 471; the average meat count was 72 per pound. The yield of meat from raw scallop by weight was 13.2%.

The **Avalon Harvester** completed 42 sets on Bed Two taking 134 bushels (3,160 kgs., 6,968 lbs.) of raw scallop for an average of 3.2 bushels (76 kgs., 167 lbs.) per tow (Table 1). The average number of scallops per bushel for this vessel was 428; the meat count was 71 per lb. The yield of meat from the raw scallops was 12.4%.

Combined catch rates on Bed Two ranged from 1/8 bushel (3.2 kgs., 7 lbs.) to 14 bushels (330 kgs., 728 lbs.) with an average of 3.1 bushels (73 kgs., 160 lbs.) per tow. Catch averaged 463 scallops per bushel and the number of meats per lb. was 72. Meat yield on this bed was 12.9%.

All calculations for Bed Two, except the catch rates, are based on Icelandic scallops. However, on this bed there was a 10% mixture of sea scallops with the Icelandic scallop catch. The number of sea scallop meats per pound was 49 with a yield of 11.9% of round weight. This sea scallop mixture would improve the meat count per pound to 69.3.

The bottom of Bed Two consisted of small rocks and gravel, and the scallops were very clean. Catches contained little empty shell which

indicated that the bed was fairly new. This bed was less densely populated than Bed One. The meats were firm with a high yield.

During her best trip on this bed, the **Sea Sons II** spent 9 hours fishing making 14 sets[1] for a total catch of 70.5 bushels (1,663 kgs., 3,666 lbs.). Averaging 5 bushels (119 kgs., 262 lbs.) per tow or 7.8 bushels (185 kgs., 407 lbs.) per hour of fishing. The **Avalon Harvester** completed 10 sets[2] in a 6.5 hours period, taking 80 bueshels (1,887 kgs., 4,160 lbs.) for an average of 8.0 bushels (189 kgs., 416 lbs.) per tow or 12.3 bushels (290 kgs., 640 lbs.) per hour. For a complete summary of results by set number see Appendix I.

ONBOARD SHUCKING ANALYSIS

Shucking rates varied widely depending on the scallop type, size and age, and the skill and experience of the shucker. The skill and experience of the shucker also determined to a degree the number of meats per pound and the yield; if a person is not skilled at scallop shucking some of the meat will be left on the shell, which lowers the yield and increases the number of meats per pound.

Bed One

On Bed One the shucking rate ranged from 3 lbs./hr. to 5.3 lbs./hr., averaging 4.4 lbs./hr. (Table 2). An experienced technician had a rate of 6.9 pounds per hour for the one sample. The individual shucking rates for crewmembers 1, 2 and 3 showed very little improvement over the length of the project. Bed one scallops were old, stringy and full of sand. The meats were

[1]For details see Appendix I, Sets Nos. 149 to 162.

[2]For details see Appendix II, Sets Nos. 279 to 288.

very easily separated from the shell; as a consequence was a 15% meat loss in shucking due to the meat being pulled out of the shell and discarded with the soft body parts.

The samples used to calculate shucking rates had an average yield of 6.8% which was 0.8% lower then the overall average for bed one. The number of meats per pound for these samples averaged to 83 which is three lower than the overall average for bed one. For individual shucking rates see Table 2.

Table 2. Scallop Analysis and Shucking Rates for Randomly Selected Scallops of Iceland Scallops from Bed One.

Crew #	Date	No. of Meats per lb.	Shucking Rate lbs./hr.	Yield %	Comments
1	Oct. 3	91	3.6	6.67	First started shucking
	Oct. 14	84	3.0	4.81	
	Oct. 16	78	3.8	6.62	
2	Oct. 3	100	4.6	6.0	First started shucking
	Oct. 14	67	4.7	6.6	
	Oct. 14	77	4.3	7.4	
	Oct. 16	83	5.0	8.8	
3	Oct. 3	73	5.3	8.2	First started shucking
	Oct. 14	72	4.6	6.7	
	Oct. 14	90	4.1	6.8	
4	Oct. 24	85	4.3	6.90	
5	Oct. 24	77	4.9	6.87	
6	Oct. 24	87	4.2	6.5	
7	Oct. 4	94	4.9	6.4	
	Aug.	83	4.4	6.8	
9*	Sept. 13	89	6.9	9.9	

*Experienced Technician - #9 Sample not included in Aug.

Bed Two

On Bed Two the average shucking rate for Iceland scallops was 6 lbs. per hour (Table 3). The rate ranged from a low of 2.88 lbs. per hour, when the crew was learning, to a high of 8.48 lbs. per hour. The experienced technician had an average shucking rate of 11.03 lbs. per hour.

On this bed the individual shucking rates for crewmembers increased with experience. The scallops on this bed were fairly new and clean and only 2% of the meats were lost when shucking.

The samples used for the shucking rates had an average yield of 12.8% which was 0.1% lower than the overall average for Iceland scallops from this bed. The number of meats per pound for the samples averaged 74, two higher than the overall bed average. (For individual shucking rates of bed two refer to Table 3).

The catch on bed two included 10% giant scallops, which were not included in the above calculations. The shucking rate for the giant scallops averaged to 10.88 lbs. per hour (Table 4). The rate for the experienced technician was 21.25 lbs. per hour. The average yield for the giant scallops was 11.52% while the average number of meats per pound was 49.

FINANCIAL ANALYSIS

The financial success of scallop fishing on the St. Pierre Bank, using vessels 65 ft. or less, depends on many factors. Unfortunately, not all questions concerning financial success can be answered within a 2 month charter period. This is especially true when considering the impact of: increasing ability as experience is gained, anomolies such as unusually poor weather, and a conflicting goal of the project to search for productive beds.

Table 3. Scallop analysis and shucking rates for randomly selected samples of Iceland scallops from Bed Two.

Crew #	Date	# of Meats per lb.	Shucking Rate lbs./hr.	Yield %	Comments
1	Oct. 15	88	4.1	9.64	
	Oct. 15	76	4.1	9.83	
	Nov. 5	74	5.6	11.36	
	Nov. 5	62	6.4	13.25	
	Nov. 6	75	5.7	13.10	
	Nov. 6	79	5.5	11.90	
	Nov. 6	84	5.0	12.84	
2	Oct. 15	65	5.6	15.3	
	Oct. 15	69	5.4	12.3	
	Nov. 5	59	6.7	14.7	
	Nov. 5	67	6.4	13.6	
	Nov. 6	69	7.0	13.7	
	Nov. 6	70	7.0	13.8	
	Nov. 6	71	6.8	15.3	
	Nov. 12	67	7.4	13.7	
3	Oct. 15	69	5.7	14.1	
	Oct. 15	67	5.9	11.8	
	Oct. 16	69	5.6	10.2	
	Nov. 5	61	6.7	14.8	
	Nov. 5	65	8.3	13.6	
	Nov. 6	70	7.0	13.8	
	Nov. 6	69	8.1	14.4	
	Nov. 6	78	6.4	13.9	
	Nov. 12	68	7.3	13.1	
4	Sept.13	90	2.9	9.78	First started shucking
	Sept.27	77	7.0	9.56	
	Oct. 14	72	7.5	13.10	
	Oct. 15	77	6.4	14.49	
	Oct. 16	75	6.2	15.76	
	Oct. 22	75	5.2	12.76	
5	Sept.13	112	2.4	7.87	First started shucking
	Oct. 4	81	4.8	11.58	
	Oct. 14	72	6.7	13.39	
	Oct. 15	70	6.9	13.22	
	Oct. 16	75	6.6	15.77	
	Oct. 22	77	6.2	13.29	

Cont'd.

Table 3 Cont'd. Scallop analysis and shucking rates for randomly selected samples of Iceland scallops from Bed Two.

Crew #	Date	# of Meats per lb.	Shucking Rate lbs./hr.	Yield %	Comments
6	Oct. 15	69	5.1	13.9	First started shucking
	Oct. 16	75	5.3	13.5	
	Oct. 22	78	4.9	12.5	
8	Sept.13	95	3.3	9.26	
	Sept.24	79	5.5	10.46	
	Oct. 14	83	5.7	10.88	
	Oct. 15	74	6.3	14.06	
	Oct. 16	72	8.5	14.77	
	Oct. 22	78	6.3	12.52	
Average		78.1	5.65	12.43	
9*	Oct. 8	49	12.00	-	
	Oct. 15	67	10.06	14.8	

* Experienced Technician (not included in average)

Table 4. Scallop Analysis and Shucking Rates for Giant Scallops from Bed Two.

Crew #	Date	# of Meats per lb.	Shucking Rate lbs./hr.	Yield %	Comments
1	Nov. 12	51	8.9	10.76	
2	Nov. 12	48	11.9	12.1	
3	Nov. 12	48	11.1	11.1	
8	Oct. 15	50	11.6	12.11	
Average		49	10.88	11.52	
9*	Oct. 15	46	21.25	13.3	

*Experienced Technician (not included in average)

Therefore, certain assumptions and projections were made necessary to at least indicate to fishermen the magnitude of costs and revenues involved in a scallop fishery. This analysis is intended to allow fishermen to compare their own situation to the two vessels chartered, and thereby identify comparative advantages or disadvantages which might make their situation more (or less) viable.

COSTS OF SCALLOP FISHING

Table 5 shows certain typical costs for Newfoundland crab vessels.

Table 5

Average selected costs for Crab Vessels in the Newfoundland Region
(average length of 54', 4")
(average age of 8.75 years)

Insurance	$ 4,720.00
Interest charges	$ 5,131.00
Rentals	$ 536.50
Storage	$ 154.00
Fees	$ 680.50
Depreciation	$11,655.50
Repair and Maintenance	$ 7,982.00
	$30,859.50

Source: Costs and Earnings of Selected Inshore and Nearshore Fishing Enterprises in the Newfoundland Region, Economics Branch, Department of Fisheries and Oceans, Newfoundland Region, September, 1985.

Note: The costs for the two charter vessels were in actuality substantially higher than the costs presented here. This is due to the charter vessels being newer and larger than the averages presented above. Average figures are used to protect confidential information and to better reflect average costs.

The additional cost of "rigging-out" with scallop fishing gear should be added to the $30,859.50 figure. Costs have been estimated to be approximately $13,435 for vessels other than those rigged for bottom trawling and approximately $12,400 for Otter Trawlers. These figures include $6,035.00 ($5,000 for an Otter Trawler) for the purchase and installation of sheeting material and $7,400 for the purchase of a 10' offshore scallop rake with spare parts for repairs.

If the $13,435 were financed over 7 years at 9% interest, the annualized cost to convert a crab vessel would be $2,669.38, thereby bringing the above costs up to $33,528.88 per annum. Although this "additional" cost could be reduced by selling gear and equipment used to pursue other fisheries, such an action is considered to be unlikely.

Provisions

Different vessels have different arrangements for the purchase of provisions. A vessel which did not return to its "true" home port would likely have its crew living onboard for a major part of the fishing season. Using a fishing season of 150 days as an example, the following formula is used to find the assumed cost for provisions (including skipper):

4 crew members x 150 days x $5 per crew per day = $3,000

Ice

The cost of ice is largely dependent on the elapsed time from purchase. Although increased ice usage will accelerate melting, storage of ice will also result in an expenditure. During the charter period, the two vessels purchased a total of $520 of ice, which converts to an average of $5.60 per day for each vessel. Again using the 150 day example, the formula for finding the cost of ice is as follows:

$5.60 per day x 150 days = $840.00

Fuel

Fuel costs are determined by: a) size of the vessel; b) engine horsepower; c) operating R.P.M. which the skipper chooses; d) distance travelled; e) scallop bed(s) fished; and f) number of trips made.

For any one fishing vessel, its size and horsepower are considered to be fixed. The operating R.P.M. which the skipper chooses can significantly affect the amount of fuel consumed and the amount of time available for harvesting.

The amount of steaming required on the banks is determined by weather, tides and the skipper's decision to look for better grounds. As a skippper becomes more experienced on the grounds, the time spent searching for scallop beds is expected to become negligible and is therefore removed from this analysis. So as to adjust for time spent searching during this project, 41% of the **Sea Sons II's** efforts and 34% of the **Avalon Harvester's** efforts are allocated as non-fishing time.

The **Sea Sons II** consumed approximately $9,211.99 worth of fuel during the charter period while the **Avalon Harvester** consumed an estimated $5,690.05 in fuel. Using the adjustments of 41% and 34% to remove searching efforts, the **Sea Sons II** would have spent $5,473.16 on fuel while the **Avalon Harvester** would have consumed $3,761.13 in fuel.

These estimates are rather high due to the large number of trips which had to be made because of poor weather. The **Sea Sons II** made 119 tows during its fishing effort and, using the 43 minutes per tow estimate, should have fished an average of 4 hours, 33 minutes per fishing day. The **Avalon Harvester** made 87 fishing tows and should have fished for an average 5 hours, 49 minutes per fishing day.

The variance between hours fished per day for the two vessels is largely attributable to the beds fished. If the **Sea Sons II** had spent the same amount of time on Bed 2 as the **Avalon Harvester,** (by converting the steaming time to Bed 1 to fishing time) an additional 13.7 hours could have been spent fishing, thereby increasing the **Sea Sons II's** average fishing time to 5 hours, 17 minutes per day.

Crew Share

The number of crew is a key determinant in choosing an appropriate crew sharing arrangement. The size of crew is discussed on page 28. Crew share is calculated as 50% of Revenue (see page 29).

REVENUES FROM SCALLOP FISHING

Revenues obtained from scallop fishing depend mainly on the number and duration of fishing trips, the catch rates and the selling price.

Both the catch rates experienced and the selling price received depend on which scallop bed is fished. Using the highest catch rates which were experienced as part of the commercial fishery simulation, the catch rate for Bed 1 would be 11.5 bushels per tow, while the catch rate for Bed 2 would be 8.0 bushels per tow.

From the catch rates alone it would appear that if Bed 1 might be the obvious choice for harvesting. Although it is more densely populated, bed 1 has quality problems, with scallops being stringy, filled with sand, and having smaller meats than Bed 2.

By comparing the results of a single average tow we get the following results:

	Bed One	Bed Two*
Catch (bushels)	11.5	8.0
Number of scallops per bushel	393	452
Catch (number of scallops)	4,513	3,618
Catch (in pounds)	597	416
Meat lost in shucking (per cent)	15%	1.99%
Final yield (percentage)	7.6%	12.9%
Final yield (in pounds)	45.53	53.65
Number of meats per pound	86	69
Estimated price (per pound)	3.00	4.05
Revenue (dollars per tow)	$136.58	$217.30

*Sea scallops have been added into these figures, as normal fishing activity on Bed 2 would invariably result in the catching of this species.

As Bed 1 is 16 nautical miles farther away from Fortune, these figures must be adjusted for a lesser amount of fishing time for an equal amount of effort. If a vessel were to steam at 8 knots per hour, the additional steaming time needed to fish Bed 1, rather than Bed 2, would be 4 hours per trip. Using the estimate of 43 minutes per tow, the 4 hours would translate into approximately 5.6 tows on Bed 2 or $1,212.82 of revenue foregone per trip.

When the vessels were fishing for large catches, it was observed that three crewmembers were needed full-time to handle the gear and sort the catch from the debris. As a commercial venture would undoubtedly be fishing for large catches, a three man crew would result in the bulk of the catch being stowed, with shucking occurring only during bad weather and during travel back to port. This operating procedure would result in the transportation of scallops in the round form, with corresponding high transportation costs and a long period of time between harvesting and shucking.

As scallops should be held round for no more than 2 days, and an allowance of approximately 1 day should be made for pick-up, transportation, and plant scheduling, a vessel would have to land with round scallops harvested the previous day. Using a three man crew a vessel could harvest for only 12 hours before it would have to return to port.

Adding crewmembers for the purpose of shucking would increase the amount of value added, lower transportation costs, reduce fuel costs and give the vessel flexibility to take advantage of good weather. Due to space

limitations, however, the size of the crew is unlikely to be sufficiently large as to have all scallops shucked on all fishing trips.

The number of hours a vessel could spend harvesting before returning with round scallops which had been harvested the previous day will vary with the number of shuckers as illustrated below:

Number of Shuckers	0	1	2	3	4
Total crew*	3	4	5	6	7
Hours Fishing	11.8	15.2	20.2	28.4	43.9
Days Fishing**	1.3	1.7	2.3	3.2	4.9

* Excluding skipper
** One day fishing equals 9 hours of actual towing and shucking time.

Given a crew of seven and 43.9 hours of harvesting activity, an estimated 64 tows would be made, of which, 79.5% of the scallops would be shucked and 20.5% would be landed round. Revenue from the sale of these scallops is estimated to be $12,662.09.*

Net Revenue

Table 6 presents the revenues and costs which have been derived from the preceeding analysis.

Table 6

Net Revenue from Scallop Fishing
(150 day season, 100 days fishing**)

Revenue:	
Sales	$253,241.80
Costs:	
Insurance	4,720.00
Interest charges	5,881.09
Rentals	536.50
Storage	154.00
Fees	680.50
Depreciation	11,655.50
Repair and maintenance	7,982.00
Net gear purchases	1,919.29
Provisions	6,000.00
Ice	840.00
Fuel	37,600.00
Crew Share (50%)	126,620.90
	$204,589.78
Net Revenue	$ 48,652.02

** 20 trips of 5 days duration

*The $12,662.09 estimate is calculated from the $217.30 per tow estimate for Bed Two (see page 27) with an estimated price of 40¢ per pound of round scallops.

CONCLUSIONS

During a 1985 offshore scallop fishing experiment conducted on the St. Pierre Bank, two beds of Icelandic scallops were found which might have a commercial harvesting potential.

The first bed found, Bed One, comprises the northwest corner of the St. Pierre Bank in depths between 35 and 55 fathoms. The average catch rate for this bed was 8.4 bushels per set with a yield of 29.3 pounds of meats per set. This low yield was caused by the scallops being old and small, resulting in lost meats when shucked at commercial shucking speeds.

The second bed found, Bed Two, was located on the northeastern portion of the Bank in depths of 20 to 30 fathoms. Although the catch rate, 3.1 bushels per set on average, was lower than Bed One, the yield of 20.6 lbs. was significantly higher.

Comparing the most productive portions of each bed, Bed Two would be more financially attractive: it is closer to the Burin Peninsula; the selling price is expected to be higher because of better quality, and higher shucking speeds; and higher yield can be attained.

A vessel would need a skipper and three crewmembers to handle the harvesting activities; adding four crewmembers for shucking, a vessel should be able to fish Bed Two for five days before having to return to port to avoid spoilage.

Gross revenue from one season of operation, using the assumptions listed in the financial analysis, is calculated to be $253,241.80 with a crew share of $126,620.90 or, an average of $15,827.51 per crewmember. Net revenue for the vessel is calculated at $48,652.02.

The potential of this fishery should improve significantly if an automated means of shucking onboard could be acquired at a price in $50,000 to $75,000 range.

Fishermen investigating the potential of this fishery are invited to validate/change the assumptions used so as to determine the financial implications of their own situation.

ACKNOWLEDGEMENTS

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We acknowledge the valuable support provided by Tim O'Leary who was Observer onboard for part of the charter period. He also contributed to the writing of this report.

Figures in this report were drawn by Doreen Stacey, while typing was provided by Judy Guest.

APPENDIX I

SUMMARY OF RESULTS

Table A-1. Summary of Results - Offshore Scallop Fishing - St. Pierre Bank

Set No.	Position		Set Direction (OM)	Set Duration (Minutes)	Depth (Fathoms)		Approximate Catch (lbs.)	Average No. Meats/lb.	Scallop Bed No.
	Latitude	Longitude			Start	Finish			
1	46°38.1'	56°29.2'	0	20	48	45	0	-	-
2	46°38.8'	56°34.5'	45	20	57	52	0	-	-
3	46°41.0'	56°36.8'	325	20	56	57	0	-	-
4	46°42.0'	56°40.5'	280	20	50	48	0	-	-
5	46°41.9'	56°42.8'	230	20	54	49	0	-	-
6	46°41.1'	56°44.2'	225	22	32	27	(24 scallops)	-	-
7	46°39.8'	56°45.3'	215	20	28	28	(20 scallops)	-	-
8	46°38.8'	56°45.2'	190	20	28	29	13	-	-
9	46°38.0'	56°45.3'	215	23	29	28	0	-	-
10	46°36.7'	56°44.6'	152	20	28	28	50	-	-
11	46°36.3'	56°44.3'	280	20	29	29	30	-	-
12	46°41.7'	56°51.3'	270	22	30	30	208	70	-
13	46°41.4'	56°52.6'	105	20	32	30	62	60	-
14	46°40.9'	56°51.7'	270	20	30	29	(25 scallops)	-	-
15	46°41.1'	56°52.8'	80	20	30	31	78	64	-
16	46°41.6'	56°51.3'	80	20	31	30	(4 scallops)	-	-
17	46°41.6'	56°51.3'	300	20	30	31	(3 scallops)	-	-
18	46°41.6'	56°52.2'	175	20	31	30	26	65	-
19	46°40.9'	56°52.0'	65	18	29	30	52	72	-
20	46°41.3'	56°51.4'	325	20	31	30	(25 scallops)	-	-
21	46°41.7'	56°51.0'	125	20	30	30	78	-	-
22	46°40.8'	56°50.4'	230	22	29	28	(12 scallops)	-	-
23	46°40.0'	56°51.3'	220	20	27	28	(4 scallops)	-	-
24	46°40.6'	56°48.6'	275	20	29	29	182	64	2
25	46°41.1'	56°49.7'	160	20	30	29	(50 scallops)	-	2
26	46°40.6'	56°48.8'	275	24	29	30	286	76	2
27	46°41.2'	56°50.4'	165	25	29	29	39	-	2
28	46°40.7'	56°49.4'	320	25	29	30	182	74	2
29	46°45.3'	57°05.6'	310	18	49	53	(1 scallop)	-	-
30	46°44.3'	57°09.4'	270	15	44	49	104	78	1
31	46°43.8'	57°11.4'	270	20	45	49	156	80	1

Table A-1 Continued. Summary of Results - Offshore Scallop Fishing - St. Pierre Bank

Set No.	Position		Set Direction (OM)	Set Duration (Minutes)	Depth (Fathoms)		Approximate Catch (lbs.)	Average No. Meats/lb.	Scallop Bed No.
	Latitude	Longitude			Start	Finish			
32	46°43.0'	57°13.7'	250	20	43	48	676	85	1
33	46°42.8'	57°14.9'	110	20	48	47	156	83	1
34	46°43.2'	57°13.5'	270	22	47	48	130	84	1
35	46°39.0'	57°09.0'	120	20	29	29	0	-	1
36	46°42.6'	57°14.4'	65	18	42	50	728	86	1
37	46°42.4'	57°14.9'	90	20	36	38	(60 scallops)	-	1
38	46°43.1'	57°14.1'	35	15	51	49	39	-	1
39	46°43.3'	57°13.2'	270	25	48	49	208	83	1
40	46°42.8'	57°14.5'	100	20	47	48	494	85	1
41	46°40.7'	56°49.3'	320	20	30	29	78	65	2
42	46°41.0'	56°50.0'	155	20	29	29	(50 scallops)	-	2
43	46°40.7'	56°49.1'	310	22	29	30	39	59	2
44	46°35.3'	56°54.7'	235	18	25	26	-	-	-
45	46°43.3'	57°13.4'	265	23	48	47	234	95	1
46	46°42.8'	57°14.9'	135	20	48	32	13	-	1
47	46°42.7'	57°14.3'	90	20	41	47	169	82	1
48	46°43.2'	57°13.6'	265	22	48	48	80	90	1
49	46°42.6'	57°15.6'	235	20	50	38	364	85	1
50	46°41.8'	57°16.7'	240	22	48	54	728	-	1
51	46°41.2'	57°17.6'	90	20	48	35	364	-	1
52	46°40.0'	57°18.4'	50	25	45	44	936	86	1
53	46°41.6'	57°16.9'	75	20	43	38	702	90	1
54	46°42.4'	57°14.9'	65	25	40	43	676	85	1
55	46°43.0'	57°13.7'	270	25	44	52	468	-	1
56	46°41.6'	57°16.9'	300	20	45	51	780	82	1
57	46°41.5'	57°16.8'	250	30	39	50	728	-	1
58	46°42.9'	57°13.7'	280	28	42	44	624	80	1
59	46°42.2'	57°16.0'	250	25	48	48	884	89	1
60	46°41.2'	57°17.3'	235	18	41	46	312	-	1
61	46°35.7'	57°03.8'	130	10	25	22	0	-	-
62	46°35.0'	57°01.8'	145	10	24	25	0	-	-

Table A-1 Continued. Summary of Results - Offshore Scallop Fishing - St. Pierre Bank

Set No.	Position		Set Direction (OM)	Set Duration (Minutes)	Depth (Fathoms)		Approximate Catch (lbs.)	Average No. Meats/lb.	Scallop Bed No.
	Latitude	Longitude			Start	Finish			
63	46°32.0'	56°54.3'	285	18	24	26	**(25 scallops)	-	-
64	46°32.1'	56°55.1'	160	22	26	23	**(19 scallops)	-	-
65	46°31.2'	56°53.2'	110	25	22	25	**(5 scallops)	-	-
66	46°31.4'	56°50.9'	90	22	23	22	**(4 scallops)	-	-
67	46°33.4'	56°45.6'	90	20	36	30	**(65 scallops)	-	-
68	46°44.8'	56°22.6'	130	15	28	28	0	-	-
69	46°46.2'	56°17.6'	100	2	(Rake hooked up and was hauled back)			-	-
70	46°42.7'	57°14.3'	280	25	43	49	546	90	1
71	46°42.5'	57°15.6'	100	23	50	45	377	87	1
72	46°42.9'	57°13.8'	270	22	44	48	624	91	1
73	46°42.5'	57°15.3'	245	25	45	44	520	88	1
74	46°41.9'	57°16.3'	105	20	40	34	260	63	-
75	46°41.1	56°47.2	250	20	28	29	(19 scallops)	-	-
76	46°40.8'	56°48.6'	250	12	29	29	13	-	2
77	46°40.8'	56°49.8'	300	18	28	30	442	72	2
78	46°41.0'	56°50.0'	140	20	29	28	65	66	2
79	46°40.7'	56°49.2'	325	22	29	30	78	73	2
80	46°41.3'	56°50.4'	320	20	30	28	(75 scallops)	-	2
81	46°41.2'	56°50.4'	160	25	30	29	65	69	2
82	46°40.6'	56°50.0'	295	20	29	30	52	74	2
83	46°27.7'	57°00.6'	230	20	25	24	**26	-	-
84	46°27.7'	57°01.3'	270	10	24	24	**(3 scallops)	-	-
85	46°28.0'	57°01.2'	110	10	24	24	**26	-	-
86	46°28.0'	57°00.5'	65	12	24	25	**17	-	-
87	46°28.8'	56°52.0'	270	18	25	25	**(46 scallops)	-	-
88	46°28.6'	56°53.7'	265	20	25	25	**17	-	-
89	46°28.4'	56°55.2'	60	23	25	25	**39	*22	-
90	46°27.5'	56°55.1'	75	20	25	24	**13	*22	-
91	46°28.2'	56°53.2'	295	30	23	25	**26	-	-
92	46°28.4'	56°55.5'	270	20	24	26	**17	-	-
93	46°27.6'	56°59.1'	210	15	22	22	**(32 scallops)	-	-

Table A-1 Continued. Summary of Results - Offshore Scallop Fishing - St. Pierre Bank

Set No.	Position		Set Direction (OM)	Set Duration (Minutes)	Depth (Fathoms)		Approximate Catch (lbs.)	Average No. Meats/lb.	Scallop Bed No.
	Latitude	Longitude			Start	Finish			
94	46°27.0'	57°00.1'	295	20	23	23	**(14 scallops)	-	-
95	46°25.1'	57°07.4'	275	20	24	25	-	-	-
96	46°22.0'	57°16.0'	10	12	39	36	-	-	-
97	46°23.4'	57°17.6'	320	8	39	40	-	-	-
98	46°35.8'	57°19.8'	30	15	45	40	-	-	-
99	46°39.6'	57°18.6'	30	20	46	39	260	70	1
100	46°40.6'	57°18.2'	45	25	52	47	884	-	1
101	46°42.0'	57°16.4'	240	20	48	50	468	-	1
102	46°43.3'	57°13.0'	250	20	47	47	156	-	1
103	46°42.9'	57°14.3'	245	25	46	43	390	0	1
104	46°42.4'	57°15.6'	245	25	45	48	754	-	1
105	46°41.4'	57°17.2'	245	25	44	50	468	-	1
106	46°40.8'	57°17.8'	70	25	44	36	780	-	1
107	46°40.2'	56°47.8'	290	22	28	29	13	-	2
108	46°40.5'	56°48.7'	245	20	28	29	52	-	2
109	46°40.6'	56°49.9'	355	22	29	30	208	-	2
110	46°43.2'	57°13.7'	260	25	49	50	364	-	1
111	46°42.4'	57°15.4'	230	25	43	49	611	-	1
112	46°42.0'	57°16.6'	110	25	51	42	546	-	1
113	46°42.8'	57°14.5'	85	25	44	44	416	-	1
114	46°43.2'	57°13.3'	285	28	46	45	390	-	1
115	46°42.1'	57°15.7'	250	28	40	50	806	-	1
116	46°41.3'	57°17.6'	115	25	48	35	143	-	1
117	46°41.6'	57°16.8'	250	28	44	46	858	-	1
118	46°40.5'	57°18.2'	50	28	49	30	624	90	1
119	46°41.4'	57°17.1'	80	27	44	36	520	-	1
120	46°42.5'	57°15.3'	20	20	46	37	468	-	1
121	46°40.7'	57°17.8'	65	28	45	38	741	-	1
122	46°41.9'	57°16.2'	60	30	41	45	858	-	1
123	46°42.8'	57°14.1'	265	21	44	44	598	-	1
124	46°42.3'	57°15.6'	200	30	43	45	819	-	1

Table A-1 Continued. Summary of Results - Offshore Scallop Fishing - St. Pierre Bank

Set No.	Position		Set Direction (OM)	Set Duration (Minutes)	Depth (Fathoms)		Approximate Catch (lbs.)	Average No. Meats/lb.	Scallop Bed No.
	Latitude	Longitude			Start	Finish			
125	46°41.7'	57°17.0'	95	35	45	48	871	-	1
126	46°42.9'	57°14.7'	240	25	49	48	546	-	1
127	46°42.1'	57°16.3'	90	28	49	43	572	-	1
128	46°40.7'	56°49.6'	320	20	28	29	52	68	2
129	46°40.8'	56°49.7'	160	15	29	29	39	-	2
130	46°40.6'	56°49.1'	315	20	29	30	*312	74	2
131	46°41.1'	56°49.9'	215	22	29	29	*91	70	2
132	46°40.5'	56°49.2'	320	23	29	30	*104	76	2
133	46°41.2'	56°50.2'	165	28	30	29	*39	-	2
134	46°40.3'	56°49.2'	25	28	29	30	*104	68	2
135	46°41.4'	56°50.1'	250	20	30	31	*65	-	2
136	46°41.4'	56°50.9'	245	25	30	30	*(12 scallops)	-	2
137	46°41.3'	56°51.1'	155	26	30	28	*208	-	2
138	46°40.6'	56°50.0'	15	25	29	29	*91	69	2
139	46°40.7'	56°50.0'	320	25	29	31	*143	75	2
140	46°41.2'	56°50.8'	180	25	29	28	*286	79	2
141	46°39.3'	56°49.1'	40	20	26	24	*13	-	2
142	46°40.2'	56°49.6'	320	20	28	29	*260	67	2
143	46°41.2'	56°50.4'	155	27	30	28	*195	74	2
144	46°40.5'	56°49.7'	330	25	28	30	*585	76	2
145	46°49.6'	56°49.9'	330	20	29	30	*26	-	2
146	46°41.2'	56°50.2'	190	15	30	28	*143	57	2
147	46°40.4'	56°50.5'	5	23	29	30	*78	-	2
148	46°41.2'	56°50.3'	190	27	29	28	*52	-	2
149	46°40.7'	56°49.9'	335	25	29	30	*286	-	2
150	46°41.5'	56°50.6'	170	27	30	29	*130	-	2
151	46°40.6'	56°50.2'	85	20	29	30	*221	-	2
152	46°41.4'	56°50.5'	315	20	31	34	(6 scallops)	-	2
153	46°41.7'	56°51.4'	175	30	30	28	*247	-	2
154	46°40.7'	56°50.1'	350	25	29	29	*182	-	2
155	46°41.2'	56°50.1'	180	25	29	28	*247	-	2

Table A-1 Continued. Summary of Results - Offshore Scallop Fishing - St. Pierre Bank

Set No.	Position		Set Direction (OM)	Set Duration (Minutes)	Depth (Fathoms)		Approximate Catch (lbs.)	Average No. Meats/lb.	Scallop Bed No.
	Latitude	Longitude			Start	Finish			
156	46°40.5'	56°50.2'	290	30	29	28	*546	-	2
157	46°40.7'	56°50.5'	330	35	28	28	*585	-	2
158	46°40.5'	56°50.3'	10	35	28	27	*377	-	2
159	46°40.4'	56°50.3'	340	35	28	28	*260	-	2
160	26°40.5'	56°49.4'	335	30	28	29	*39	-	2
161	46°41.2'	56°50.4'	250	22	29	28	*364	-	2
162	46°40.2'	56°50.3'	5	23	28	29	*182	-	2
163	46°40.2'	56°44.3'	315	28	30	28	(3 scallops)	-	-
164	46°41.2'	56°44.4'	205	14	29	29	(12 scallops)	-	-
165	46°40.5'	56°50.0'	310	30	29	29	*156	-	2
166	46°40.5'	56°50.5'	335	30	29	29	*442	-	2
167	46°41.1'	56°50.2'	230	30	29	29	*26	-	2
168	46°40.2'	56°50.1'	10	20	29	30	*130	-	2
169	46°41.2'	56°50.2'	335	25	30	29	-	-	2
170	46°41.4'	56°50.7'	185	32	31	29	*52	-	2
171	46°40.8'	56°50.3'	0	10	29	30	*39	-	2
172	46°43.2'	57°13.2'	245	28	42	48	208	-	1
173	46°42.7'	57°15.0'	240	30	47	51	624	-	1
174	46°41.7'	57°17.0'	250	35	46	45	546	-	1
175	46°43.8'	57°09.1'	300	20	38	40	182	-	1
176	46°43.7'	57°11.3'	250	20	41	43	286	-	1
177	46°43.4'	57°12.5'	115	30	44	46	117	-	1
178	46°43.2'	57°13.5'	270	25	46	47	234	-	1
179	46°42.8'	57°15.1'	95	27	45	40	364	-	1
180	46°43.1'	57°13.1'	275	30	45	45	455	-	1
181	46°42.6'	57°15.0'	80	30	45	41	312	-	1
182	46°43.0'	57°13.1'	275	25	45	45	312	-	1
183	46°42.4'	57°15.7'	80	30	45	45	468	-	1
184	46°43.2'	57°13.5'	270	30	43	43	390	-	1
185	46°42.2'	57°16.1'	80	33	43	43	416	-	1
186	46°43.3'	57°13.2'	280	30	50	45	234	-	1

Table A-1 Continued. Summary of Results - Offshore Scallop Fishing - St. Pierre Bank

Set No.	Position		Set Direction (OM)	Set Duration (Minutes)	Depth (Fathoms)		Approximate Catch (lbs.)	Average No. Meats/lb.	Scallop Bed No.
	Latitude	Longitude			Start	Finish			
187	46°42.4'	57°15.5'	80	30	45	45	468	-	1
188	46°43.2'	57°13.1'	280	30	45	45	624	-	1
189	46°42.4'	57°15.6'	80	35	45	45	520	-	1
190	46°42.4'	57°15.6'	280	35	45	45	624	-	1
191	46°42.4'	57°15.8'	80	30	45	45	286	-	1
192	46°43.0'	57°13.7'	270	30	44	45	546	-	1
193	46°42.1'	57°16.0'	90	30	42	45	468	90	1
194	46°43.0'	57°13.6'	270	30	42	44	676	-	1
195	46°41.9'	57°16.7'	90	30	44	44	468	-	1
196	46°43.1'	57°13.6'	270	30	44	44	689	-	1
197	46°42.2'	57°16.1'	90	30	44	44	364	-	1
198	46°43.0'	57°13.5'	270	30	44	45	416	-	1
199	46°42.3'	57°15.8'	90	30	44	44	299	-	1
200	46°43.3'	57°12.7'	270	30	44	44	494	-	1
201	46°42.3'	57°15.6'	90	30	44	45	416	-	1
202	46°43.1'	57°13.4'	270	30	45	45	468	-	1
203	46°42.3'	57°16.1'	270	30	43	45	624	-	1
204	46°41.0'	57°17.9'	90	15	45	45	312	-	1
205	46°38.8'	56°45.4'	210	30	30	30	13	-	-
206	46°37.8'	56°45.7'	315	20	28	28	52	-	-
207	46°39.1'	56°45.8'	300	20	28	28	26	-	-
208	46°38.7'	56°47.2'	170	20	28	29	13	-	-
209	46°36.0'	56°48.5'	225	17	30	31	*(16 scallops)	-	-
210	46°34.8'	56°48.9'	190	10	31	31	*(1 scallop)	-	-
211	46°33.6'	56°48.7'	285	20	30	29	0	-	-
212	46°33.6'	56°50.2'	120	15	30	34	*52	-	-
213	46°33.6'	56°48.5'	270	20	30	32	**(24 scallops)	-	-
214	46°33.5'	56°50.1'	120	25	27	32	**13	-	-
215	46°33.6'	56°48.8'	280	20	30	30	**26	**28	-
216	46°33.5'	56°50.1'	115	15	28	30	**52	**28	-
217	46°32.8'	56°47.5'	115	26	30	43	78	50	-

Table A-1 Continued. Summary of Results - Offshore Scallop Fishing - St. Pierre Bank

Set No.	Position		Set Direction (OM)	Set Duration (Minutes)	Depth (Fathoms)		Approximate Catch (lbs.)	Average No. Meats/lb.	Scallop Bed No.
	Latitude	Longitude			Start	Finish			
218	46°33.0'	56°44.9'	115	28	33	33	0	-	-
219	46°31.7'	56°42.8'	225	20	29	30	*(30 scallops)	-	-
220	46°30.8'	56°45.6'	290	27	30	30	*52	-	-
221	46°31.7'	56°51.3'	290	25	20	20	0	-	-
222	46°20.1'	56°48.6'	340	20	30	30	0	-	-
223	46°21.3'	56°50.2'	290	25	23	23	**(7 scallops)	-	-
224	46°21.3'	56°53.1'	250	25	23	23	**(25 scallops)	-	-
225	46°20.7'	56°56.2'	270	30	23	24	13	-	-
226	46°20.0'	56°59.3'	330	27	23	22	**(***)39	-	-
227	46°21.7'	56°59.9'	20	29	24	27	**39	-	-
228	46°23.6'	57°00.3'	190	30	27	28	**39	**25	-
229	46°22.0'	57°00.6'	120	30	22	23	**13	-	-
230	46°22.2'	56°58.9'	10	30	23	23	**52	**26	-
231	46°40.1'	56°48.0'	340	25	27	27	**(11 scallops)	-	-
232	46°36.8'	56°46.0'	290	20	26	28	*13	-	-
233	46°37.0'	56°46.9'	140	20	28	25	**(12 scallops)	-	-
234	46°42.8'	57°13.8'	275	22	37	43	156	75	1
235	46°42.4'	57°16.1'	75	27	41	39	208	72	1
236	46°43.0'	57°13.4'	240	26	42	32	52	65	1
237	46°42.0'	57°16.3'	80	26	45	44	104	90	1
238	46°43.0'	57°14.0'	270	27	42	43	286	-	1
239	46°42.1'	57°16.6'	75	29	47	46	104	94	1
240	46°43.1'	57°13.8'	270	30	40	44	195	80	1
241	46°43.5'	57°12.1'	250	30	44	42	234	85	1
242	46°42.8'	57°14.5'	75	30	44	42	143	89	1
243	46°43.8'	57°11.2'	250	32	42	40	169	93	1
244	46°43.0'	57°13.6'	250	32	40	45	338	-	1
245	46°41.9'	57°17.0'	240	28	45	40	390	86	1
246	46°40.3'	57°18.5'	50	30	40	40	338	87	1
247	46°42.0'	57°16.3'	240	30	36	38	416	-	1
248	46°40.7'	57°18.3	50	30	40	43	520	76	1

Table A-1 Continued. Summary of Results - Offshore Scallop Fishing - St. Pierre Bank

Set No.	Position		Set Direction (OM)	Set Duration (Minutes)	Depth (Fathoms)		Approximate Catch (lbs.)	Average No. Meats/lb.	Scallop Bed No.
	Latitude	Longitude			Start	Finish			
249	46°39.9'	56°40.5'	280	25	47	42	0	-	-
250	46°39.8'	56°44.8'	260	21	33	28	(20 scallops)	-	-
251	46°39.8'	56°45.4'	205	22	30	29	*130	68	2
252	46°38.2'	56°45.4'	15	23	28	30	*91	-	2
253	46°39.6'	56°45.4'	210	25	29	28	*39	78	2
254	46°38.0'	56°45.5'	15	25	29	28	*104	70	2
255	46°39.8'	56°45.4'	210	29	28	28	*104	70	2
256	46°39.6'	56°45.4'	210	36	28	27	*39	-	2
257	46°37.7'	56°45.5'	25	28	27	27	*39	-	2
258	46°39.1'	56°45.3'	270	26	27	27	*(25 scallops)	-	2
259	46°37.9'	56°47.6'	200	27	28	30	*13	-	2
260	46°36.7'	56°47.7'	20	26	30	28	*39	-	2
261	46°34.4'	56°47.5'	15	30	30	30	*52	-	2
262	46°37.2'	56°47.5'	190	15	30	30	*78	-	2
263	46°36.9'	56°47.4'	195	30	30	32	*65	-	2
264	46°36.3'	56°47.4'	20	20	30	30	*52	-	2
265	46°36.0'	56°47.6'	10	25	30	30	*91	-	2
266	46°36.8'	56°47.4'	195	30	30	30	*26	-	2
267	46°35.2'	56°47.5'	20	30	30	30	*13	-	2
268	46°36.1'	56°47.4'	195	25	28	29	*52	-	2
269	46°40.2'	56°49.8'	295	30	29	30	*39	-	2
270	46°40.1'	56°51.1'	110	25	28	28	*26	-	2
271	46°40.4'	56°48.7'	280	25	30	30	*6	-	2
272	46°40.3'	56°40.4'	95	35	29	30	0	-	2
273	46°40.4'	56°48.0'	180	35	28	30	*78	-	-
274	46°40.0'	56°43.4'	95	25	25	30	*78	-	-
275	46°41.5'	56°43.4'	150	25	25	28	*39	-	-
276	46°39.7'	56°48.5'	285	23	29	29	0	-	2
277	46°40.3'	56°50.5'	278	8	28	28	*195	65	2
278	46°40.2'	56°50.6'	230	30	28	28	*520	68	2
279	46°40.3'	56°50.6'	325	18	28	28	*572	-	2

Table A-1 Continued. Summary of Results - Offshore Scallop Fishing - St. Pierre Bank

Set No.	Position		Set Direction (OM)	Set Duration (Minutes)	Depth (Fathoms)		Approximate Catch (lbs.)	Average No. Meats/lb.	Scallop Bed No.
	Latitude	Longitude			Start	Finish			
280	46°40.9'	56°51.4'	145	18	28	28	*364	-	2
281	46°40.6'	56°50.7'	340	24	28	28	*494	-	2
282	46°40.3'	56°50.6'	330	24	28	28	*156	-	2
283	46°40.3'	56°51.0'	330	16	28	28	0	-	2
284	46°40.8'	56°51.6'	145	17	28	28	*832	-	2
285	46°40.4'	56°50.9'	330	22	28	28	*494	-	2
286	46°40.3'	56°50.8'	330	20	20	28	*884	-	2
287	46°40.4'	56°50.8'	325	18	28	28	*156	-	2
288	46°40.8'	56°52.2'	140	15	28	28	*208	-	2
289	46°40.3'	56°50.7'	330	25	28	28	*130	66	2
290	46°40.7'	56°52.4'	90	20	29	28	*364	66	2
291	46°40.8'	56°52.5'	330	25	28	28	*156	70	2
292	46°37.4'	56°47.7'	190	20	29	30	*78	66	2
293	46°35.8'	56°47.2'	45	30	30	30	*104	-	2
294	46°36.2'	56°48.0'	195	25	30	30	*26	70	2
295	46°40.3'	56°47.6'	190	25	30	29	*130	69	2

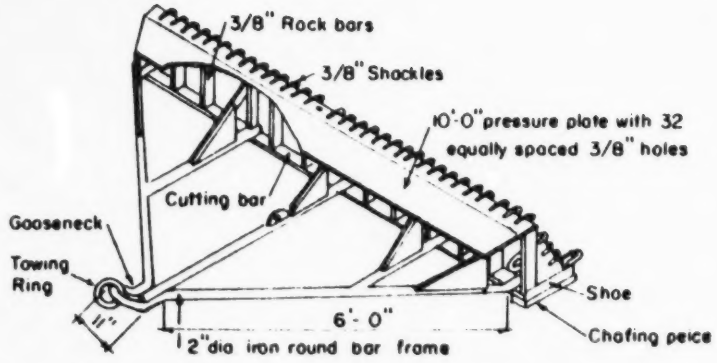
*All catches contain up to 10% sea scallops.
**Sea scallops.
***Also caught one basket sea scallop seeds.

APPENDIX II

OFFSHORE SCALLOP RAKE

a) CONSTRUCTION DETAILS

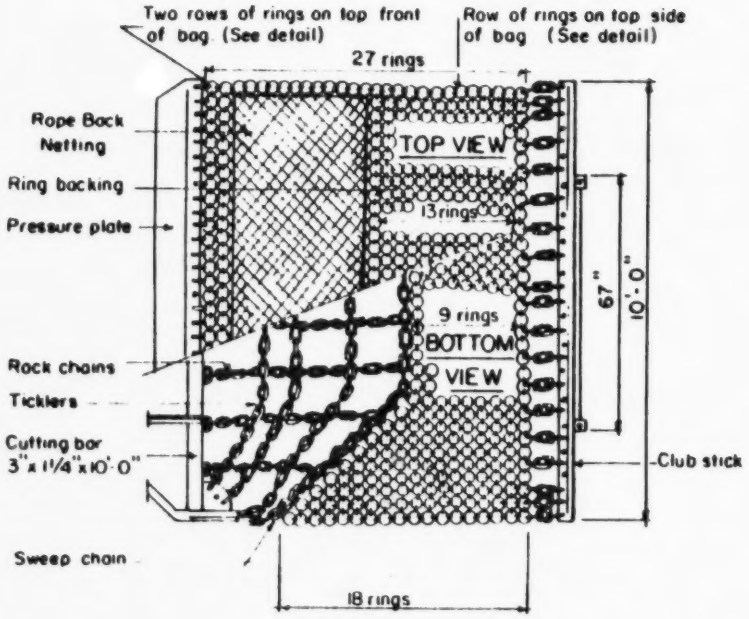
b) FISHING TECHNIQUE



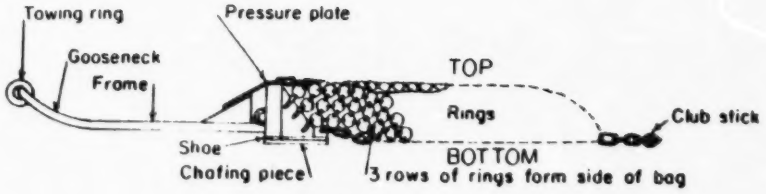
A. ISOMETRIC OF BUCKET FRAME

GENERAL NOTES

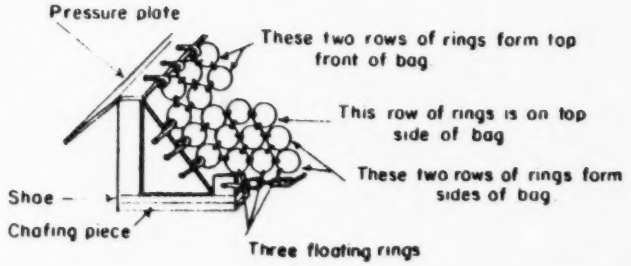
1 Standard ring size is 3" x 3/8"
2 Top link size is 5/16", bottom link size is 3/8"
3 Top rings are connected with one link
4 Bottom rings are connected with three links
5 Top and bottom sections are connected with one link, except for the last two rows which have two links



B. TOP & BOTTOM PLAN VIEW OF BAG



C. SIDE VIEW


Pressure plate
These two rows of rings form top front of bag
This row of rings is on top side of bag
These two rows of rings form sides of bag
Shoe
Chafing piece
Three floating rings

D. DETAIL

Fig. A2-1 Offshore Scallop Bucket Construction Detail.

FISHING TECHNIQUE

The offshore scallop rake has two main parts, a strong metal framework designed to facilitate towing and to scrape scallops of the sea bed; and a bag constructed of rope netting, wire-ring mesh and chains, designed to hold the scallops scooped up during a tow.

The main framework is triangle shaped. Two sides are formed by two six-foot round iron bars of 2 inch diameter and shaped into a gooseneck where they join (Fig. A2-1, A). A towing ring, to which are shackled a swivel and towing wire, is secured to the gooseneck.

The base of the triangle is a 10 foot long, 14 inch high rectangular iron frame jointed at the ends of its bottom or "cutting" bar, to the ends of the two round iron bars (Fig. A2-1, A). It is the cutting bar which scrapes the scallops from the sea bed. Uprights of 3/8"x3"x14" iron plates called "rock bars" are welded between the cutting bar and the top bar of the rectangular frame. At each end of the frame a flat steel shoe is welded to the bottom of the cutting bar to project backwards away from the towing bars. Metal chafing plates are welded to the bottoms of the shoes (Fig. A2-1, A and D).

Three strengthening bars, equally spaced along the cutting bar, join the cutting bar to the two main frameworks. Five flat metal bars and triangular plates join the towing bars and strengthening bars to the top bar of the rectangular frame (Fig. A2-1, A). Across the top of these sloping bars a 10 inch wide pressure plate is welded. It runs the full length of the top bar of the rectangular frame, to which it is attached, and it slopes downward toward the towing bars, thus helping to keep the rake pressed firmly to the sea bed during towing.

The scallop bag is attached with 3/8" shackles all around its mouth to the rectangular frame described above.

The bottom of the bag, which rides along the sea bed, is constructed mainly of 3 inch x 3/8 inch metal rings joined together by 3/8 inch links. Nine, 32-ring rows of rings the rearward section of the bottom (Fig. A2-1, B). At the outer ends of this section and extending forward in two points toward the shoes of the cutting bar are two triangular shaped sections or ring-mesh each measuring nine rings on each side.

The roughly U-shaped area thus left between the ring-mesh and the cutting bar is filled with a coarse grid of 3 inches x 5/8 inch chain arranged as follows: a "sweep chain" 83 links long attached to the trailing ends of the cutting bar shoes and to the ring-mesh (Fig. A2-1, B and D); two to four other shorter lengths of chain, called "ticklers", attached to the corners formed by the cutting bar and the shoes and spanning the U-shaped area in front of the ring-mesh at graduated intervals; a series of chain lengths, called "rock chains", attached to the cutting bar at equal intervals and extending straight back across the "ticklers" (to which they are attached) to join the sweep chain (Fig. A2-1, B).

The top of the bag has three separate sections. At the front, attached to the top bar of the rectangular frame, are two 32-ring rows of ring-mesh (Fig. A2-1, B).

Extending rearward from this is a section of 6 inch x 1/4 inch poly rope mesh, 62 meshes wide and eight meshes deep (front to back). At each of the two outer ends of the rope mesh section is a 12-ring row of ring-mesh.

Extending rearward from the rope mesh section are thirteen 32-ring rows of ring-mesh. The last row is attached to the last row of rings in the bottom of the bag. Shackled to the bag at this juncture, and trailing the bag as it is towed, is a 10 foot straight iron bar called a "club stick". To this is attached a "tail chain" which is used in hoisting up the end of the bag to dump out its contents once the rake has been brought onboard.

The rings that make up the back section of the top of the bag are each joined to the other by two 5/16 inch links, except for those in the last two rows, which are each joined by 3/8 inch links. The rings in the bottom of the bag are joined to each other by three 3/8 inch links. The top and bottom sections of the bag are joined along their sides with single 3/8 inch links. club stick and bag was then placed over the rail and the rake made ready for the next set.

The average time for a complete set was approximately 43 minutes which included 2 minutes for setting, 26 minutes for towing, 12 minutes for retrieving the gear and dumping the contents, and 3 minutes for positioning the vessel for the next set.

Sorting of the catch took place after the rake was taken off the table. The scallops were sorted from the debris and placed into one bushel baskets. Then they were dumped into a box on the starboard side of the vessel for shucking. Once the shucking box was filled, the remaining scallops were transferred to the regular 2.5 cu.ft. (76 liter) fish boxes and iced in the hold.